Marks

Question 21 (4 marks)

In his science fiction novel *From the Earth to the Moon*, Jules Verne describes how to launch a capsule from a cannon to land on the moon. To reach the moon, the capsule must leave the cannon with a speed of 1.06×10^4 m s^{-1}. The cannon has a length of 215 m, over which the capsule can be assumed to accelerate constantly.

(a) Calculate the magnitude of the acceleration required to achieve this speed using this cannon. **2**

$v = 1.06 \times 10^4 \text{ ms}^{-1}$ $v^2 = u^2 + 2as$

$u = 0$ $(1.06 \times 10^4)^2 = 0 + 2a \times 215$

$s = 215 \text{ m}$ $a = 261302.33 \text{ ms}^{-2}$

$a = ?$

∴ The capsule would need acc of. $261302.33 \text{ ms}^{-2}$

(b) Referring to your answer in part (a), explain why Jules Verne's method is unsuitable for sending a living person to the moon. **2**

This method is unsuitable because of the g-force factor. Accelerating ~~to the speed~~ at the rate determined in Part A would cause enormous g-forces to be created on the capsule and the occupants, far greater than 10g. Humans can withstand a maximum g-force of 10g, meaning Verne's method is unsuitable for sending a human to the moon as the human would not survive the massive g-forces.